

CLAIMS

What is claimed is:

1. A differential assembly for a motor vehicle, the differential assembly comprising:
 - a case;
 - a tubular preform;
 - a tubular insert having a radially extending protrusion;
 - a plurality of pinion gears rotatably coupled to said case;
 - a plurality of side gears rotatably coupled to said case, each of said side gears being in meshing engagement with each of said pinion gears, wherein at least one of said pinion gears and said side gears includes said tubular preform and said tubular insert, said tubular preform being deformed to engage said protrusion.
2. The differential assembly of claim 1 wherein said insert includes a plurality of circumferentially spaced apart protrusions in engagement with a deformed portion of said tubular preform.
3. The differential assembly of claim 2 wherein said at least one of said pinion gears and said side gears includes net-shaped gear teeth.
4. The differential assembly of claim 3 wherein said net-shaped teeth engage teeth of an adjacent gear.

5. The differential assembly of claim 3 wherein said net-shaped teeth are hardened without the addition of carbon to said net-shaped teeth.

6. The differential assembly of claim 1 wherein said protrusion includes an upper surface and a lower surface, said preform being out of engagement with said upper and lower surfaces prior to deformation, said preform being in engagement with said upper and lower surfaces after deformation.

7. The differential assembly of claim 6 wherein said tubular insert includes a radially extending flange having a recess positioned between each protrusion of a plurality of protrusions, said preform being deformed to engage said tubular insert within said recesses.

8. The differential assembly of claim 7 wherein said preform is constructed from powdered metal.

9. A method of manufacturing a differential assembly including a case and a gear, the gear having a tubular insert and a tubular preform, the tubular insert having a radially extending protrusion, the method comprising the steps of:

positioning the tubular insert within a die;

positioning the tubular preform over said insert;

forging the preform in said die to define a gear having a first portion engaging said protrusion; and

rotatably mounting said gear in the case.

10. The method of claim 9 wherein said forging step includes forming an upper lip and a lower lip on said first portion to axially restrain the tubular insert from movement relative to said first portion.

11. The method of claim 10 further including engaging said upper and lower lips with the protrusion.

12. The method of claim 9 wherein said forging step includes forming net-shaped teeth on said first portion.

13. The method of claim 9 wherein said tubular insert includes a plurality of protrusions circumferentially spaced apart, said method further including encapsulating said protrusions within said first portion during said forging step.

14. The method of claim 13 wherein said tubular insert includes a recess positioned between each protrusion of said plurality of protrusions, said forging step including deforming said preform to enter said recesses.

15. The method of claim 9 wherein said forging is performed in a closed die.

16. The method of claim 9 further including inserting a pin within the tubular insert to resist deformation of the tubular insert during forging.

17. The method of claim 16 wherein said pin includes an outer surface having a contour complementary to an inner surface of the tubular insert to further resist deformation of the tubular insert during forging.

18. The method of claim 9 further including forming the tubular preform from powdered metal.

19. The method of claim 9 further including positioning a meltable material between the tubular insert and the tubular preform prior to forging the preform to bond said first portion to the insert.